

CLAIMS

1. A gas-barrier laminate comprising a plastic substrate (A), an inorganic thin film (B) formed on at least one surface of the plastic substrate (A), and a coating layer (C) formed by applying a coating material on a surface of the inorganic thin film (B), said coating layer (C) containing a polyester-based resin (c1) having a molecular weight of 3000 to 15000 and a polyurethane-based resin (c2) having a molecular weight of 8000 to 30000 at a weight ratio of 5/95 to 95/5, and said gas-barrier laminate having an oxygen permeability of not more than 25 fmol/m²/s/Pa.

2. A gas-barrier laminate according to claim 1, wherein the polyester-based resin (c1) and the polyurethane-based resin (c2) respectively have a glass transition temperature (T_g) of 55 to 100°C and an acid value of 1 to 100 mgKOH/g.

3. A gas-barrier laminate according to claim 1 or 2, wherein the coating layer (C) contains a silane coupling agent in an amount of 0.1 to 20% by weight.

4. A gas-barrier laminate according to claim 3, wherein the silane coupling agent is an epoxy group-containing silane coupling agent and/or an amino group-containing silane coupling agent.

5. A gas-barrier laminate according to any one of

claims 1 to 4, wherein the coating material contains a fatty acid, a fatty ester, a fatty amide or a mixture thereof in an amount of 0.05 to 20 parts by weight based on 100 parts by weight of a sum of the polyester-based resin (c1) and the
5 polyurethane-based resin (c2).

6. A gas-barrier laminate according to any one of claims 1 to 5, wherein the coating material contains a polyisocyanate as a curing agent and a content of the
10 polyisocyanate in the coating material is 0.8 to 1.5 times a total hydroxyl equivalent of the polyester-based resin (c1) and the polyurethane-based resin (c2).

7. A gas-barrier laminate according to claim 6, wherein
15 the polyisocyanate contains at least one compound having three or more active isocyanate group in a molecule thereof.

8. A gas-barrier laminate comprising a plastic substrate (A), an inorganic thin film (B) formed on at least
20 one surface of the plastic substrate (A), and a coating layer (C) formed on a surface of the inorganic thin film (B), said coating layer (C) having a hardness of 0.1 to 0.5 GPa as measured at 23°C in atmospheric air by a nano-indentation hardness testing method, and the gas-barrier
25 laminate exhibiting an oxygen permeability of not more than 50 fmol/m²/s/Pa as measured with respect to a gas-barrier film obtained by laminating an unstretched polypropylene film having a thickness of 60 μm on the coating layer (C) of

the gas-barrier laminate after subjecting the gas-barrier film to hydrothermal treatment at 120°C for 30 min.

9. A gas-barrier laminate comprising a plastic
5 substrate (A), an inorganic thin film (B) formed on at least one surface of the plastic substrate (A), and a coating layer (C) formed on a surface of the inorganic thin film (B), said coating layer (C) having a hardness of 0.03 to 0.5 GPa as measured at 23°C in water by a nano-indentation
10 hardness testing method, and the gas-barrier laminate exhibiting an oxygen permeability of not more than 50 fmol/m²/s/Pa as measured with respect to a gas-barrier film obtained by laminating an unstretched polypropylene film having a thickness of 60 μm on the coating layer (C) of the
15 gas-barrier laminate after subjecting the gas-barrier film to hydrothermal treatment at 120°C for 30 min.

10. A gas-barrier laminate comprising a plastic
substrate (A), an inorganic thin film (B) formed on at least
20 one surface of the plastic substrate (A), and a coating layer (C) formed on a surface of the inorganic thin film (B), said coating layer (C) having a ratio of number of carbon atoms derived from carboxyl groups to number of carbon atoms constituting the surface of the coating layer
25 (C) of 0.005 to 0.1, and the gas-barrier laminate exhibiting an oxygen permeability of not more than 50 fmol/m²/s/Pa as measured with respect to a gas-barrier film obtained by laminating an unstretched polypropylene film having a

thickness of 60 μm on the coating layer (C) of the gas-barrier laminate after subjecting the gas-barrier film to hydrothermal treatment at 120°C for 30 min.

5 11. A gas-barrier laminate according to claim 8 or 9, wherein the ratio of number of carbon atoms derived from carboxyl groups to number of carbon atoms constituting the surface of the coating layer (C) is 0.005 to 0.1.

10 12. A gas-barrier laminate according to any one of claims 8 to 11, wherein the coating layer (C) is made of at least one resin selected from the group consisting of a polyester-based resin, an urethane-based resin, an acrylic resin, an alkoxysilyl group-containing resin, an oxazoline
15 group-containing resin and copolymer resins thereof.

 13. A gas-barrier laminate according to any one of claims 8 to 11, wherein a gas-barrier film obtained by forming a printed layer on the coating layer (C) of the gas-
20 barrier laminate and further laminating an unstretched polypropylene film having a thickness of 60 μm on the printed layer exhibits an oxygen permeability of not more than 50 $\text{fmol}/\text{m}^2/\text{s}/\text{Pa}$ after subjecting the gas-barrier film to hydrothermal treatment at 120°C for 30 min.

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 14. A gas-barrier laminate according to any one of claims 1 to 13, wherein the plastic substrate (A) comprises a polyester resin, a polyamide resin, a polyolefin resin, an

ethylene-vinyl alcohol copolymer resin or a biodegradable resin.

15. A gas-barrier laminate according to any one of
5 claims 1 to 14, wherein the inorganic thin film (B) is a physically vapor-deposited film or a chemically vapor-deposited film comprising silicon oxide, aluminum oxide, diamond-like carbon or a mixture thereof.

10 16. A gas-barrier laminate according to any one of claims 1 to 15, further comprising an anchor coat layer disposed between the plastic substrate (A) and the inorganic thin film (B).

15 17. A gas-barrier laminate according to claim 16, wherein the anchor coat layer is made of at least one resin selected from the group consisting of a polyester-based resin, an urethane-based resin, an acrylic resin, an alkoxysilyl group-containing resin, an oxazoline group-
20 containing resin and copolymer resins thereof.

18. A gas-barrier laminate according to any one of claims 1 to 17, further comprising a printed layer formed on a surface of the coating layer (C), and a heat seal layer
25 formed on a surface of the printed layer.

19. A gas-barrier laminate according to claim 18, further comprising at least one paper or plastic substrate

disposed between the printed layer and the heat seal layer.

20. A gas-barrier laminate according to claim 19,
wherein the plastic substrate disposed between the printed
5 layer and the heat seal layer comprises a polyester-based
resin, a polyamide-based resin, an ethylene-vinyl acetate
copolymer resin or a mixture thereof.

21. A gas-barrier laminate according to any one of
10 claims 1 to 20, wherein the gas-barrier laminate is heat-
treated at a temperature of not less than 60°C.

22. A gas-barrier laminate according to any one of
claims 1 to 21, wherein when the gas-barrier laminate is
15 subjected to hydrothermal treatment under pressure at 120°C
for 30 min, an oxygen permeability of the gas-barrier
laminate after being subjected to the hydrothermal treatment
is not more than 25 fmol/m²/s/Pa.

20 23. A gas-barrier laminate according to any one of
claims 18 to 22, wherein when the gas-barrier laminate is
subjected to hydrothermal treatment under pressure at 120°C
for 30 min, an adhesion strength between the inorganic thin
film (B) and the coating layer (C) is not less than 100 g/15
25 mm, and an adhesion strength between the coating layer (C)
and the printed layer is not less than 100 g/15 mm.